

Original Research Article

A Comparative Study on Intra Operative Problems during Primary versus Repeat Caesarean Sections

Dr. Sheethal Joseph¹, Dr. Sareena Gilvaz²

¹Junior Resident, ²Professor and HOD, Department of OBG, Jubilee mission hospital, Thrissur, Kerala, India

***Corresponding author**

Dr. Sheethal Joseph

Email: sheethaljozz@gmail.com

Abstract: Caesarean section (CS) is the most common surgery done in obstetric practice. After any laparotomy, it is fairly common to develop scar tissue, adhesions and bladder extension, CS holds no exception to this. Multiple CS is associated with more difficult surgeries with increased blood loss compared with a planned second CS. This is a hospital based, observational comparative study held in Jubilee mission hospital, Thrissur from March 2014-March 2015 which includes women who undergoes CS for first time and those who had undergone previous one or more CS. There were 100 cases of primary CS and 100 cases of repeat CS in the study population. In the primary CS group 79% had no complications while 21% had complications including postpartum haemorrhage and extension of uterine incision. While in the repeat CS group 54% had no complications while the rest had a variety of complications including adhesions (34%), thin lower uterine segment (17%), extension of uterine incision(3%) and 2 cases of placenta accreta. requiring obstetric hysterectomy. Though the incidence of complications increased with number of CS, the incidence of adhesions and placenta previa was found to have no relation with increasing CS while the incidence of thin lower uterine segment and placenta accreta increased with increasing number of CS. Complications in emergency CS was found to be more than in elective CS and the most common encountered one was excessive bleeding. Thus it can be concluded that repeat caesarean sections are associated with increased morbidity. The best way to reduce this is to reduce the primary section rates.

Keywords: Caesarean section, adhesions, placenta previa, placenta accreta, thin lower uterine segment.

INTRODUCTION

Caesarean section (CS) is a surgical intervention which is done to ensure the safety of the mother and the fetus when vaginal delivery is not possible (emergency CS) or when there is greater danger to the mother or fetus with vaginal delivery (elective CS). In 1985 the World Health Organization (WHO) stated: "There is no justification for any region to have CS rates higher than 10-15%". A figure below 5 per cent implies that a substantial proportion of women do not have access to surgical obstetric care; on the other hand a rate higher than 15 per cent indicates over utilization of the procedure for other than life saving reasons (WHO, 1985; WHO, 1993). In 2009 WHO stated that 'optimum rate is unknown' and world regions might want to continue to use a range of 5-15% or set their own standard.

CAESAREAN SECTION IN INDIA

In India the rate of caesarean section delivery has increased from 3 per cent to 10 percent between 1992-93 and 2005-06 (IIPS, 2007) which is lower compared to some developing nations like Brazil and

China. But as India is the second most populous country in the world, a small percentage increase affects a huge number of people.

Based on DLHS-3 data (2007-2008), the caesarean section delivery rate in India is 9.2 per cent. However, a substantial inter-state variation of CS exists in India. Among the large states, the proportion of women who have undergone caesarean deliveries is the highest in Kerala (31.8 per cent) followed by Andhra Pradesh (29.3 per cent) and Tamil Nadu (23.2 per cent) and the lowest in Rajasthan and Jharkhand (4.2 per cent in both the states) [1]. Except Karnataka, in all other southern states, CS has crossed the WHO recommended level of 15 per cent. Among major states, CS rate of 5 percent or lower prevails in Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh and Rajasthan. In India the rural-urban difference between C-section rates is quite conspicuous. The rate of CS is higher in urban areas than their rural counterparts for all the states.

After any laparotomy, it is fairly common to develop scar tissue, adhesions and bladder extension,

CS holds no exception to this. Multiple CS is associated with more difficult surgeries with increased blood loss compared with a planned second CS. The risk of major complications increase with number of previous CS. Scaring and adhesion formation is known to cause increase in the major complication rates from 4.3 to 12.5% [2] depending up on the number of previous caesarean section. Intra peritoneal adhesions have an incidence varying from 5.5% to 42.5%³. Women with a history of CS have a higher risk of hemorrhage ,placenta previa uterine rupture ,stillbirth in the following pregnancies, all this contributing to the maternal as well as fetal morbidity.

The present study aims at knowing the various intraoperative complications encountered during repeat caesarean sections with respect to those undergoing primary CS. The various complications in elective and emergency CS are also addressed.

MATERIALS AND METHODS

Study area:

The present study is being conducted in the department of Obstetrics and Gynecology of Jubilee Mission Hospital, Thrissur.

Study population:

The study population includes 200 women who underwent Caesarean Section in our hospital. This was divided into: A. 100 women undergoing primary and B. 100 women undergoing repeat caesarean sections.

Study Design:

It is an observational comparative study of 200 consecutive cases of primary and repeat caesarean sections

Sample size:

Was calculated as 200 according to the equation $n = p * (1-p) / L^2$

Where, p= prevalence of CS in our hospital

L= sample size in studies

n =sample size in our study

Study Duration:

Period of one year from March 2014- March 2015

Inclusion Criteria:

All women who underwent one or more caesarean sections irrespective of age and parity including emergency and elective.

Exclusion Criteria:

- All women who have undergone other abdominal surgeries.
- Women who had other co morbidities which may affect complications.

Methodology of Study:

Patients were selected according to the inclusion criteria. Case histories of primary and repeat caesarean deliveries were studied and the data recorded. This is an observational comparative study done in 200 caesarean cases. This includes 100 consecutive cases of primary and 100 consecutive cases of repeat caesarean sections done in our hospital during the study period. The particular difficulties we encounter while operating were meticulously noted. The collected data were analyzed for type and incidence of the intraoperative problems. The observed intra-operative problems were analyzed and categorized in relation to age, parity, number of CS, indication for CS for both previous and present, whether emergency or elective etc. The intra-operative complications in both primary and repeat caesarean sections were compared with respect to adhesions(peritoneal, bladder, bowel, omentaletc),blood loss, difficulty in delivery of baby, extension of tears over uterus, bladder injury ,abnormal placentation, scar dehiscence, uterine rupture, need for hysterectomy etc.

RESULTS AND DISCUSSION

In this study conducted in Jubilee Mission Hospital, 200 cases of caesarean sections were taken .This included 100 consecutive cases of primary CS and 100 consecutive cases of repeat CS done during the study period. This was analysed as given below.

TABLE 1: MATERNAL DEMOGRAPHIC CHARACTERS

	GROUP 1(n=100) Mean ± SD	GROUP 2(n=100) Mean±SD
MATERNAL AGE	24.26±4.66	28.35±4.41
PARITY SCORE	PRIMI	2.2
BLOOD LOSS IN ML	415±221	436±191
TIME TAKEN FOR SX (IN MINUTES)	46.25±11.026	55.15±20.11
GESTATIONAL AGE	38.7±2.4	37.3±2.7

GROUP 1 =PRIMARY CS GROUP 2 =REPEAT CS

TABLE 2: RELATIONS BETWEEN NO. OF CS AND COMPLICATIONS

NO. OF PREV CS	PPH	EXTENSION OF UTERINE INCISION	ADHESIONS	THIN LUS	TOTAL	PERCENTAGE
0(n=100)	14	7	-	-	21	21%
1(n=73)	3	3	24	7	37	51%
2(n=25)	2	0	10	9	21	84%
3(n=2)	0	0	0	2	2	100%

Complications in 1 st, 2nd, 3 rd and 4 th CS were 21%, 51%, 84% and 100% respectively. Hence as

number of CS increased the complications also increased.

TABLE 3: RELATION BETWEEN NO. OF REPEAT CS AND ADHESIONS

NO.OF CS	ADHESIONS	NIL	TOTAL	PERCENT
1(n=73)	24	49	73	33%
2(n=25)	10	15	25	40%
3(n=2)	0	2	2	0

Pearson’s chi-square test was done and the p value was 0.479, which is of asymptomatic significance (p<0.05).Hence according to this study there is no relation between no. of CS and adhesion formation,

though there is more adhesions in those with previous 2 CS than in those with previous 1 CS. There were no adhesions encountered in those with previous 3 CS in our study.

TABLE 4: RELATION BETWEEN NO. OF REPEAT CS AND THIN SCAR

NO. OF CS	THIN SCAR	NIL	TOTAL	PERCENT
1(n=73)	7	66	73	9.5%
2(n=25)	9	16	25	36%
3(n=2)	2	0	2	100%
P VALUE				0.005

The incidence of thin LUS in those with previous section was found to be 9.5% in those with previous 1 CS, 36% in those with previous 2 CS and

50% in those with previous 3 CS .Pearson Chi square test shows a p value of 0.005 and thus implies that as the no of CS increase the chance of thin scar increases.

TABLE 5: RELATION BETWEEN NO. OF REPEAT CS AND PLACENTA PREVIA

NO. OF REPEAT CS	PLACENTA PREVIA	PLACENTA ACCRETA	TOTAL	PERCENT
1	2	1	3	4%
2	1	1	2	8%
3	0	0	0	0

The incidence of placenta previa was found to be 4 % in those with previous 1 CS and 8 % in those with previous 2 CS. There were no cases of placenta previa in the study population with previous 3 CS. The incidence of placenta accreta in those with previous CS and placenta previa was found to be 33% in previous 1 CS and 50% in previous 2 CS.

EMERGENCY VERSUS ELECTIVE CASES

Elective cases in our study is larger than emergency as people with repeat CS not willing for VBAC were electively taken for CS at 38 weeks.

TABLE 6: COMPLICATIONS – ELECTIVE VS EMERGENCY

TYPE OF CS	PPH	EXTENSION OF UTERINE INCISION	NIL	PERCENT	TOTAL
ELECTIVE	7	3	65	25%	87
EMERGENCY	14	7	68	39.8%	113
P VALUE	0.00				

In the study population 25% in the elective CS group had some variety of complication while 40% in the emergency group had some complications. The most common complication encountered in emergency CS was haemorrhage.

DISCUSSION

Modern obstetrics, for medical, social, economic, and legal reasons has witnessed an increase in the primary caesarean section rates everywhere. This has created a common clinical entity of “previous caesarean section” in subsequent pregnancies, giving a high risk pregnancy status to the reference pregnancy. This raises the difficulty of not only deciding the mode of delivery – VBAC or elective caesarean section, but also of difficulties in repeat procedure making it a high risk surgical procedure.

INTRAOPERATIVE COMPLICATIONS IN PRIMARY CS (TABLE 2)

In our study the overall complication rate of a primary caesarean section is 21%. The causes of these complications included pph (14%) and extension of uterine incision (7%). 93%, the cause of pph was atonic pph and remaining was due to placenta previa and bleeding.

In a similar study the overall complication rate was 12%. Uterine cervical lacerations and postpartum haemorrhage were the main causes of these complications. The rate of complications were 14.5% in emergency group and 6.8% in elective group.

The reported incidence of general complications related to CS in another study is 27%. Häger *et al.*[5]; reported an incidence of 21.4% in a prospective study similar to this study[5]. Which is similar to our study? Van Ham *et al.*; reported an incidence of 35.7% in a retrospective study of data derived from patient records.

The incidence of hemorrhage related to CS varies in different studies. The rates were 7.9% in the study by Häger *et al.*[5]; and 9.9% in elective CS and 10.9% in emergency CS in the study by Karlström *et al.*; [6], Häger *et al.*[5].

INTRAOPERATIVE COMPLICATIONS IN REPEAT CS (TABLE 2)

The complication rate of repeat CS in our study was 46%. This included adhesions(34%), thin LUS(17%), extension of uterine incision(3%), postpartum haemorrhage(5%), placenta previa (3%), placenta accreta(2%) which needed caesarean hysterectomy. There were no cases of scar dehiscence, uterine rupture and bladder injury in the study group.

In a study by Farkhundah *et al.*; [7] the overall complication rate was 52.23% in this study. Dense adhesions were found in 65 (27%) cases, extremely thinned-out lower uterine segment was found in 28 (11.6%) cases, scar dehiscence was seen in 15 (6.25%) cases, ruptured uterus in 4 (1.6%) cases, placenta praevia in 6 (2.5%) cases, morbidly adherent placenta in 2 (0.8%) cases, bladder injury occurred in 2 (0.8%) cases while fetal demise (due to ruptured uterus) occurred in 4 (1.6%) cases.

The average operative time needed for a primary CS was 46 minutes while for a repeat CS it was 55 minutes. Though not statistically significant, it shows that there is an increase in average operative time.

RELATION BETWEEN NO. OF CS AND COMPLICATIONS

In our study, it is clearly shown that as the number of CS increases, so does the complication rates. Complication rates are 21%, 51%, 85%, 100% for primary and repeat 1, 2, and 3 sections respectively. Many studies have proved the same which is described in detail below.

The relative safety of caesarean section deliveries and its perceived advantages relative to vaginal delivery has resulted in a change in the perceived risk benefit ratio, which has accelerated the acceptance for caesarean section. Although, the operation is now safer than in the past because of improvements in anaesthesia, antibiotics and blood transfusion services, a caesarean section still carries a significant risk to the mother compared to a normal vaginal delivery. Complications of caesarean section can result from any number of factors including maternal and fetal health, timing of the procedure, surgical technique, and clinician experience. Repeat caesarean section is associated with additional risks when compared with primary caesarean section [8].

ADHESIONS (TABLE 3)

Although peritoneal adhesions develop in the overwhelming majority of intra-abdominal and pelvic surgery, there is evidence in the literature that suggests that patients having CS may develop fewer adhesions. Adhesions continue to occur despite lower uterine incisions, though less to the anterior abdominal wall compared to classical incisions. The incidence of adhesion development increases with the number of CS performed is shown in many studies [9].

Morales *et al.*; [10] in his study showed After the first caesarean delivery, 100 of 217 women (46%) had pelvic adhesive disease; 48 of 64 women (75%) who underwent a third caesarean delivery and 5 of 6 women (83%) who underwent a fourth caesarean

delivery had formed pelvic adhesive disease. Compared with primary caesarean section, delivery of the infant was delayed 5.6 minutes (52%) with 1 previous caesarean birth, 8.5 minutes (79%) after 2 caesarean birth, and 18.1 (169%) during the fourth caesarean birth.

Tulandi *et al.*; [11] did a similar study .No adhesions were found in primary CS. Compared with those women with a second CS (24.4%), significantly

more women had adhesions after 3 CSs (42.8%). Compared with a first CS (7.7 +/- 0.3 minutes), the delivery time was significantly longer at subsequent CS. However, complication rates in those women with >or= 2 CSs were comparable with primary CS. Similar finding was reported by Juntune N [12] and colleagues who reported a significantly higher risk of intraperitoneal adhesions in patients undergoing their 4th to 10th CD compared to those having their 1st, 2nd, or 3rd CS.

Adhesions	Our Study	Morales <i>et al</i> [10]	Tulandi <i>et al</i> [11]	Furkundah <i>et al</i> [12]
0	-	-	-	-
1	33	46	24.4	22.8
2	40	75	42.8	35.5
3	0	83	47.9	19.4
Extra Time From Primary	9 Min	5.6 Min	9 Min	

The overall adhesion formation rate in our study is 34%. This is similar to other studies (27%). Many studies show that as the number of CS increases the adhesions also increase. But in our study there were no adhesions seen in those with previous 3 CS. Similar is seen in Furkundah *et al*[12] study group where they didn't see increased adhesions with repeat 3 CS. This can be explained in two ways – one thing it may have happened due to less no. of patients in that group or it may show that other factors like nourishment of patient, duration between subsequent pregnancies; experience

of surgeon performing previous section also has association with dense adhesions. The most common adhesions found in the group are between bladder and uterus and also between parietal peritoneum and omentum. In the study by Tulandi *et al*[11] the more adhesions were between bladder and uterus and it increased with each delivery.

Majority of these cases were associated with increased bleeding due to increase in raw surface following adhesiolysis and increased operating time.

Adhesions	Our Study (%)	Mahale <i>et al.</i> ; [13] (%)
Parietal peritoneum and anterior surface of uterus	6	6.62
Parietal peritoneum and bladder	1	3.83
Parietal peritoneum and omentum	14	4.87
Omentum and uterus	1	10.09
Bladder and uterus (dense)	19	11.14
Bladder and uterus (loose advancement)	2	6.61
Uterus and small bowel	1	0.34

THIN LUS (TABLE 4)

Despite the advantages associated with the lower segment CS scar, such scars are still relatively associated with poor healing. Juntunen and colleagues [12] reported a significantly higher percentage of thin (<2 mm) lower uterine segment in patients undergoing their 4th to 10th CD (study group) compared to those having their 1st, 2nd, or 3rd CD (control; OR, 60.4; CI, 18.4-198.3), while 10.1% of study group had membranous, transparent, or “lacerated” lower segment, none in the control group did. A recent systematic review of 12 eligible studies [14] which included 1834 women in whom ultrasound was used to evaluate the CS scar, reported a 6.6% rate of scar defect. Addition of

sonohysterogram to such evaluation in another study found that a much higher percentage (20%) had large defects [15]. Therefore, incomplete healing of the low transverse uterine incision as determined by transvaginal ultrasound may occur more frequently than earlier thought.

In our study the overall incidence of thinned out LUS is 17 %. In a similar study the incidence of extremely thinned out LUS was 11.6 %. [7]. 18% in a study by samaretal. Our study is clearly showing the relation between thinned out LUS and number of CS, as the number of CS increases the chance of thinned out

LUS increase(9.5%,36% ,100% after 1, 2, 3 sections respectively).

Though there was no case of scar dehiscence or scar rupture in our study population, this clearly

No. of CS	Our Study	Khursheed <i>et al</i> [7]
1	9.5%	8%
2	36%	16.6%
3	100%	

In the review by Kirkinen [16] 27% of patients with three or more previous Caesarean sections had fenestration of the uterine scar .Our study didn't show any cases of scar dehiscence. It is notable that risk factors for scar dehiscence such as multiple pregnancy and polyhydramnios were not present in our patients, and induction of labour was not carried out in patients with one previous CS. The risk of uterine rupture in patients with one previous CS has been shown to increase with induction of labour, depending on the agent used for the induction [17].

Poorly healed uterine scar might affect the regeneration of the isthmus of uterus and make it thinner, resulting in much thinner lower uterine segment scar in subsequent pregnancy. Thin lower uterine segment scar is likely to rupture during labor. Unsecured prediction of the integrity of the scarred lower uterine segment during labor appears to be one of the reasons for repeat caesarean sections. Several recent reports suggest that USG evaluation of lower uterine segment can be used effectively to assess its integrity to predict the risk of Intrapartum rupture [18, 19].

Risk of placenta previa	Our study	Getahun <i>et al.</i> :[23]
Primary cs	1%	0.3%
Repeat cs	4%	0.68%

However it was observed in our study that the increasing number of caesarean section does not increase the incidence of placenta praevia. This was also found in the study of Hershkowitz *et al.*; [24]. They had suggested that a single caesarean section is enough to interfere with the normal physiological

No. Of Previous Cs	Our Study	Khursheed <i>et al.</i> [7]
1	4%	2.6%
2	8%	2.2%
3	0	2.7%

Placenta accreta is a potentially life-threatening obstetric condition that requires a multidisciplinary approach to management. The incidence of placenta accreta has increased and seems

indicates that there is chance of scar rupture with increasing number of CS. So women with more number of CS we should do a TVS to assess the scar thickness.

Rozenberg *et al.*; [20] found that LUS thickness correlated inversely with the risk of rupture and concluded that thickness more than 3.5 mm is protective against rupture. In a study by Samar *et al.*; [21] they concluded that there is actually no ideal cut off value that can be recommended for clinical purposes, even if the association of LUS thickness and uterine scar defect is strong.

A number of studies have demonstrated that the risk of rupture varies inversely with the interval between the previous CS and next pregnancy and considered it to be risk factor for uterine scar dehiscence and rupture.

PLACENTA PREVIA AND PLACENTA ACCRETA (TABLE 5)

Many studies have highlighted the previous caesarean section as an important risk factor for placenta previa. The risk increased from 0.26% with a UN scarred uterus to 10% for women with four or more previous caesarean section [22]. According to a study by Getahun *et al.*; the risk of placenta previa was 0.68% compared to vaginal delivery (0.3%) [23].

stretching of lower uterine segment in subsequent pregnancies, thus preventing normal migration of placenta away to the upper uterine segment which results in increased incidence of placenta praevia with scarred uterus. Similar observation is seen in study by Khursheed *et al.*[7]

to parallel the increasing CS rate. Women at greatest risk of placenta accreta are those who have myometrial damage caused by a previous cesarian delivery with either an anterior or posterior placenta previa overlying

the uterine scar. Diagnosis of placenta accreta before delivery allows multidisciplinary planning in an attempt to reduce the potential maternal or neonatal morbidity and mortality [25].

Overall 35% of women with placenta Previa and one or more previous caesarean sections have placenta accreta. Two American studies showed the association of placenta Previa and previous caesarean sections with placenta accreta and hysterectomy. This study also confirmed the association of previous caesarean section with placenta accreta and hysterectomy. In our study the incidence of placenta accrete with placenta previa 33% which increased to 50% with 2 CS. The authors of one study found that in the presence of a placenta previa, the risk of placenta accreta was 3%, 11%, 40%, 61%, and 67% [26] for the first, second, third, fourth, and fifth or greater repeat caesarean deliveries, respectively.

The average blood loss in both these cases was 3000 ml and both these cases were managed by doing caesarean hysterectomy .Average time duration taken for surgery was 3 hours. They had to be kept in ICU and required an average of 6 bags of blood transfusion.

BLADDER INJURIES AND REPEAT CS

For post caesarean pregnancy – chance of bladder injuries increases 3-fold. (0.6% vs 0.19%; repeat caesarean vs primary caesarean) [27]. In another study repeat caesarean associated with bladder injury in 0.81% cases in compare to primary caesarean 0.27% [28]. Risk increases to 1.5% after 4 or more previous uterine incision [29]. For patient in labour – 24% vs 16% in elective caesarean (RCOG). There were no cases of bladder injury observed in the study population.

EMERGENCY VERSUS ELECTIVE CS (TABLE 6)

In the present study there were 87 cases (43%) of emergency CS and 113 cases (57%) of repeat CS. Of these 22% were primary CS in elective CS and 88% were repeat CS in this group. In emergency CS group 15% were repeat CS while 85% were primary CS.25 % in the elective had complications while 40% in the emergency group had complications. (p<0.05)The rate of excessive bleeding in elective and emergency groups was 8% and 12% respectively.

In a similar study by Suja *et al.*; [30] they compared complications between emergency and elective caesarean sections and it was concluded that intraoperative complications were more for emergency group (30.3%) when compared to elective group (19.7%). The major complication that developed in both groups was excessive bleeding 30.3% and 19.7%. The difference was of no statistical significance (p-0.119).

There were no cases of bladder injury in both the groups.

In some other studies reported previously also intra operative complications were associated more with emergency caesarean section than with elective caesarean section. Massive haemorrhage was the most common complication seen [31].

CONCLUSION

Caesarean section is one of the most commonly performed operations worldwide. Modern obstetrics has seen an increase in the caesarean section rates worldwide due to many reasons .This leads to increased number of patients with repeat CS status and thus making the pregnancy a high risk case. This raises the issue of not only deciding the mode of delivery – VBAC or elective caesarean section, but also of difficulties in repeat procedure making it a high risk surgical procedure. Although it is true that mortality related to Caesarean birth has reduced dramatically over the past decade, to practically negligible numbers, due to improvement in anaesthesia and blood transfusion, there is still definite morbidity associated with this surgical procedure.

Further clinical studies are needed to evaluate not only the effects of surgical techniques, and intra-operative management but also to investigate their effects on perioperative morbidity that is associated with caesarean section. The best technique to reduce the multiple potential risks of repeat CS is to reduce the rates of primary and repeat CS whenever possible. The evaluation of these maternal morbidities associated with the study are essential for proper counselling of females with previous one Caesarean section and planning for either TOLAC or ERCD. And also in those with placenta previa and previous section, counselling has to be given about placenta accreta and its morbidities

REFERANCES

1. Sancheeta Ghosh, KS James; Levels and Trends in Caesarean Births: Cause for Concern? , Economic& Political Weekly EPW, 2010; 5.
2. Nisenblat V, Barak S, Griness OB, Degani S, Ohel G, Gonen R; Maternal complications associated with multiple cesarian deliveries. *Obstet Gynecol.* 2006; 108(1):21-6.
3. Myers SA, Bennett TL; Incidence of significant adhesions at repeat caesarean section and the relationship to method of prior peritoneal closure. *JReprod Med.* 2005; 50(9):659-62.
4. Bergholt T1, Stenderup JK, Vedsted-Jakobsen A, Helm P, Lenstrup C. Intraoperative surgical complication during cesarean section: an observational study of the incidence and risk factors. *Acta ObstetGynecol Scand.* 2003;82(3):251-6

5. Häger RME, Daltveit AK, Hofoss D, Nilsen ST, Kolaas T, Øian Pål & al; Complications of cesarean deliveries: Rates and risk factors. *Am J ObstetGynecol* 2004; 190(2):428-34.
6. Karlström A, Lindgren H, Hildingsson I; Maternal and infant outcome after cesarean section without recorded medical indication: findings from a Swedish case-control study. *BJOG* 2013; 120(4):479-486.
7. Farkhundah Khursheed, Pushpa Siri chand, Nasreen; Intraoperative Complications Encountered in Patients with Repeat Cesarean Section *JLUMHS* 2009; 08 (01).
8. Shumaila Zia, Muhammad Rafique; Intra-operative complications increase with successive number of cesarean sections: Myth or fact. *ObstetGynecol Sci.* 2014; 57(3): 187–192
9. Awoniyi O. Awonuga, Nicole M. Fletcher, Ghassan M. Saed, Michael P. Diamond; Postoperative Adhesion Development Following Cesarean and Open Intra-Abdominal Gynaecological Operations A Review. *Reprod Sci.* 2011; 18(12): 1166–1185.
10. Morales KJ, Gordon MC, Bates GW; Jr Post cesarean delivery adhesions associated with delayed delivery of infant. *Am J Obstet Gynecol.* 2007;196(5):461.e461–e466
11. Tulandi T1, Agdi M, Zarei A, Miner L, Sikirica V; Adhesion development and morbidity after repeat cesarean delivery. *Am J Obstet Gynecol.* 2009 Jul;201(1):56
12. Juntunen K, Makarainen L, Kirkinen P; Outcome after a high number (4-10) of repeated caesarean sections. *BJOG.* 2004;111(6):561–563
13. Mahale Arun Ramkrishnarao , Ghodke Ujwala Popat , Bhingare Prashant Eknath ,Sakhare Anil Panditrao; Intra-operative difficulties in repeat cesarean sections – A study of 287cases *J ObstetGynecol India*, 2008; 58(6): 507.
14. Jastrow N, Chaillet N, Roberge S, Morency AM, Lacasse Y, Bujold E; Sonographic lower uterine segment thickness and risk of uterine scar defect: a systematic review. *J ObstetGynaecol Can.* 2010;32(4):321–327
15. Vikhareva Osser O, Valentin L; Risk factors for incomplete healing of the uterine incision after cesarean section. *BJOG.* 2010; 117(9):1119–1126.
16. Kirkinen P; Multiple caesarean sections: outcomes and complications. *Br J ObstetGynaecol*1988; 95:778–82.
17. Lydon-Rochelle M, Holt VL, Easterling TR, Martin DP; Risk of uterine rupture during labor among women with a prior cesarean delivery. *N Engl J Med* 2001; 345(1):3–8.
18. Cheung VYT, Constantinescu OC, Ahluwalia BS; Sonographic evaluation of the lower uterine segment in patients with previous caesarean delivery. *J Ultrasound Med* 2004; 23:1441-7
19. Bojold E, Jastrow N, Simoneau J, Brunet S, Gauthier RJ; Prediction of complete uterine rupture by sonographic evaluation of the lower uterine segment. *Is J ObstetGynecol* 2009; 201:320.
20. Rosenberg P., Goffinet F, Phillipp HJ; Ultrasonographic measurement of lower uterine segment to assess risk of defects of scarred uterus. *Lancet* 1996; 347 (3): 281.
21. Samar Dawood Sarsam ,Heba Abul Kadem; Measuring Lower Uterine Segment Thickness Using Abdominal Ultrasound to Predict Timing of Cesarean Section in Women with Scarred Uterus at Elwiya Maternity Teaching Hospital *KCMJ* 2013; 9(2): 9-13
22. Upadhyay N, Buist R; Cesarean section: an evolving procedure. *Br J ObstetGynaecol* 1999;106 (3): 286-92
23. Getahun D1, Oyelese Y, Salihu HM, Ananth CV; Previous cesarean delivery and risks of placenta previa and placental abruption. *Obstet Gynecol.* 2006;107(4):771-8
24. Marianne S, Handricks YH, Chow B; Previous cesarean section and abortion as risk factors for developing placenta previa. *J ObstetGynaecol Res* 1999; 25(2):137-42
25. Placenta accreta. Committee Opinion No. 529. American College of Obstetricians and Gynaecologists. *ObstetGynecol* 2012; 120:207–11.
26. Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, *et al.*; Maternal morbidity associated with multiple repeat cesarean deliveries. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. *ObstetGynecol*2006; 107:1226–32.
27. Sibai BM, Newton ER; The urinary tract in pregnancy. In: Walters MD, Karram MM (eds): *Urogynecology and Reconstructive Pelvic Surgery*, Mosby Elsevier, Philadelphia, 2007; 472-489.
28. Rahman MS, Gasem T, Al Suleiman SA, Al Jama FE, Burshaid S, *et al.*; Bladder injuries during cesarean section in a University Hospital: a 25-year review. *Arch Gynecol Obstet* 2009; 279: 349-352.
29. Scotti RJ, Young JN, Ho MH; Urologic complications. In: O’Grady JP, Gimovsky ML, Bayer-Zwirello L, Giordano K (eds.): *Operative Obstetrics* (2ndedn). Cambridge: Cambridge University Press, 2008; 608 -637.
30. Suja Daniel, ManjushaViswanathan, Simi B N, Nazeema A; study of maternal outcome of emergency and elective caesarean section in a semi-rural tertiary hospital. *Academic medical journal of India*, 2014; 4(1):14 -18.
31. Ghazi A, Karim F, Hussain A, Ali T, Jabbar S; Maternal morbidity in eme... [J Ayub Med Coll Abbottabad. 2012 Jan-Mar] -PubMed - NCBI. *Journal of Ayub Medical College Abbottabad.* 2012; 24(1):10–3.